

Microstructure modelling of silica bodies from oil palm empty fruit bunch (OPEFB) fibres

ABSTRACT

Investigating the mechanical behaviour of silica bodies in oil palm empty fruit bunches (OPEFB) is important to improve the process of silica body removal. This study will assist in providing an understanding of the role of OPEFB as a bioresource material for the bioconversion process. The microstructure of silica bodies/protrusions on the OPEFB fibre surface was modelled using the finite element method, based on the information obtained from scanning electron microscopy (SEM). The effects of silica body geometry, possible anisotropy/orthotropy, and debonding between the interface of the silica body and OPEFB fibre were investigated. Agreements were observed between the results using both circular and spiked silica body models with different geometries and volume fractions. In addition, the cohesive debonding modelling results showed that once critical stress was activated, the stress-strain curve deviated from the no-debond model. The results also suggested that the value of cohesive energy should be between 0.5 kN/m and 4 kN/m.

Keyword: Oil palm empty fruit bunch; Microstructure modelling; Silica bodies; Cohesive zone modelling